CROP PRODUCTION NEWS

Volume 33, No. 10 September 30, 2011

CROPS

Editor's Comments

By Faye Dokken-Bouchard, PAg, Crops Branch

As the 2011 growing season and this volume of newsletters draws to a close, we would like to take this opportunity to extend our appreciation to our CPN authors and readers. Approximately 580 people subscribed to CPN this season. Ten issues were made possible by 23 different Ministry specialists who contributed to 72 articles over the season. Thank you to all.

Another thank you goes out to the 45 people who took the time to respond to our CPN over the last few months. Your feedback has been and will continue to be used to keep this publication timely and interesting. Respondents were asked to indicate which types of articles were most beneficial (they could choose more than one). Insect and disease updates were selected by 89 per cent, followed by pesticide updates (78) and weed control (71). Soil/fertility issues, pulse production, Crop Protection Lab updates, oilseed production and cereal production were indicated by 60 to 67 per cent of respondents to be most beneficial. A lower response rate (13 to 53 per cent) for other types of articles is either proportionate to smaller industries and production issues, or an indication that we need to pay more attention to some of our updates to keep them relevant.

Authors are given quite a bit of liberty with their articles in terms of length and amount of information. Survey respondents seem to be ok with this: 72 per cent said they are never too long (28 per cent said sometimes) and 64 per cent said they are sometimes too short (33 per cent said never). And like Goldilocks, 41 per cent said the articles are always just right (55 per cent said sometimes and four per cent said never).

NOTE: Throughout this document, you will see that some publications are in blue font and underlined, indicating links to website information. If you are reading this on your computer screen, click your cursor on the link to take you directly to the website. ✪

Crop Production News is a bi-weekly publication prepared primarily by provincial specialists with the Crops Branch and Regional Services Branch of the Saskatchewan Ministry of Agriculture. It is a compilation of articles related to entomology, plant pathology, weed science, soils and agronomy issues.

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Saskatchewan Ministry of Agriculture

Crop Protection Laboratory Update

By Philip Northover, AAg, Supervisor, Crop Protection Laboratory

With the fall now officially here, samples submitted at this time typically are disorders/diseases that are noticed at or during harvesting. Tree disorders are beginning to show symptoms hidden by healthy foliage as the leaves begin to fall.

Figure 1: Stagonospora glume blotch caused by *Stagonospora nodorum* on wheat.
Source: Saskatchewan Agriculture

Alternaria black spot of canola, and Stagonospora leaf and glume blotch of wheat were common submissions since the last report, under the right conditions both of these diseases can cause significant yield losses. When these were submitted they were usually from areas that experienced higher than average moisture earlier in the season. Leaf rust on two wheat samples submitted were at very high levels of severity.

This year has been an interesting one for submissions (although every year is a new challenge). This year a number of unusual weeds appeared which was expected with the unusual conditions in 2010, and again in 2011.

Figure 2: Severe (2 cm) lesion of Alternaria black spot (Alternaria brassicae) on Canola stem.
Source: Saskatchewan Agriculture

Dutch Elm Disease samples were up, though the number of positives are lower than in previous years. The number of woody ornamental samples (not including Elm trees) submitted this year was considerably higher than in previous years.

By far the biggest problem this year was damage due to herbicide and environmental related injuries and disorders. Excess water, drought conditions, high temperatures, low temperatures, problems associated with poor soil conditions, and herbicide application issues, arrived almost on a daily basis in 2011.

The list below is what has been identified in the past two weeks; most of the diseases/disorders below were diagnosed multiple times.

Field Crops:
Canola: Alternaria Black spot, herbicide injury, hail damage, cabbage maggot damage, fusarium wilt, sulfur deficiency
Durum: Fusarium Head Blight
Oats: Cladosporium rot, oat red leaf
Wheat: Stagonospora leaf and glume blotch, Leaf rust, Barley Yellow dwarf, cladosporium rot

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Crop Protection Laboratory Update
(Continued from page 2)

Trees:
Apple: Apple Scab
Colorado Blue Spruce: Rhizospheara needlecast,
Manitoba Ash: Black Rot
American Elm: Dutch elm disease samples: 20 have been diagnosed in the past week, three with the disease, 17 without the disease.

Horticulture:
Potato: wireworm damage, aerial stem blight
Tomato: Tobacco Mosaic Virus

Weed Submissions:
Marsh Yellow Cress (*Rorippa islandica*)
Field Pussytoes (*Antennaria spp*)
Russian Pigweed (*Axyris amaranthoides)*
Willowherb (*Epilobium spp.*)
Madder (Rubiaceae family)
Henbit (*Lamium amplexicaule*)

Insect Submissions:
Ants (Forminciinae)

Finally renovations to the lab are underway! As this is being written walls are coming down and being rebuilt. These changes will allow for a number of exciting opportunities in diagnosis and identification to be conducted. ✡

Agriculture Knowledge Centre Update

By Brent Flaten, PAg, Integrated Pest Management Specialist

With the widespread frost the week of September 12, the Agriculture Knowledge Centre (AKC) received a lot of questions about the effects on late seeded crops. These included nitrates in feed and grain, swathing versus straight combining, when to swath cereals, canola affected by frost and assessing potential for continuing with fall weed control.

Perennial legumes and grasses seldom have nitrate accumulation in the stems and leaves after a frost. Immature annual cereals being fed to livestock is the primary concern regarding nitrate accumulation and poisoning. General guidelines used in the past have stipulated cutting during the first 12 hours of a frost or waiting 10 to 14 days before cutting. This was based on avoiding the maximum nitrate accumulation that typically occurs about 36 to 48 hours after a frost. The problem with these guidelines was that you still did not know if you had a nitrate problem or not.

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Agriculture Knowledge Centre Update
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The only way to know for sure is to test the feed. If the producer has the ability to manage high nitrate feed by diluting it out and mixing it with low nitrate feed, then the feed can be cut before the feed value deteriorates and have it tested for nitrate levels. Refer to the following document for further information on nitrate poisoning: www.agriculture.gov.sk.ca/Nitrate_Toxicity

There have also been many inquiries on post-harvest control of perennial weeds such as dandelions, quackgrass and Canada thistle after frost. Post-harvest glyphosate applications on these weeds work well at this time of year as long as the plant is healthy. Assess any frost effects such as browning or yellowing of leaves. Make sure green leaves are still flexible when bent (no cracking as they dry down). Glyphosate control is improved significantly if there have been some new leaves growing on the plant since the harvest operation. Watch herbicide mixtures such as 2,4-D and glyphosate, which may impact what you can seed next spring. For example, canola is sensitive to fall applied 2,4-D.

Control of grain storage insects has also been a common topic of inquiries to the AKC, especially in grain stored from last year's crop. Refer to the following document on grain storage insect control: www.agriculture.gov.sk.ca/Default.aspx?DN=5105b40a-724a-445c-9fc4-a3fce1c1f501.

Due to the hot weather experienced this harvest, producers are reminded of the importance of cooling hot stored grain through aeration or transferring grain from bin to bin on cool days. Oilseeds are especially sensitive to spoilage under these conditions.

Other inquiries included grasshoppers (especially on winter wheat seedlings), ergot, fusarium head blight, and aquatic weeds/algae control in dugouts.

Forage questions continue to include perennial stand termination with either glyphosate alone or tank mixed with 2,4-D. With shortened daylight at this time of year, glyphosate will provide better control by moving down into the alfalfa roots along with food reserves. Again, if adding 2,4-D amine for enhanced control, be aware of potential re-cropping issues with sensitive crops such as canola.

Questions aboutsoils have included fall fertilization with winter wheat and fall rye. If the field is not subject to saturated soils either this fall or next spring, all of the nitrogen can be applied at the time of seeding. However, if saturated soils are expected, where denitrification losses of the nitrate nitrogen can occur, then a split fall and spring application of nitrogen may be beneficial. ✡

What We Can Learn About Plant Disease after Harvest

By Faye Dokken-Bouchard, PAg, Provincial Specialist, Plant Disease

After harvest, plant disease can still rear its head by compromising seed quality and storage. No matter what the destination after harvest, seed quality affects the value and end-use suitability of the crops we grow in Saskatchewan. Marketplace seed quality is assessed at the elevator and characterized by grading factors that have been designated by the Canadian Grain Commission (CGC). Certified seed must meet germination and purity standards, but remember this does not necessarily mean it has to be disease-free. Seed that is intended for planting next year should be tested by an accredited laboratory in order to detect certain diseases and determine whether it is appropriate to use as seed or if a seed treatment is recommended.

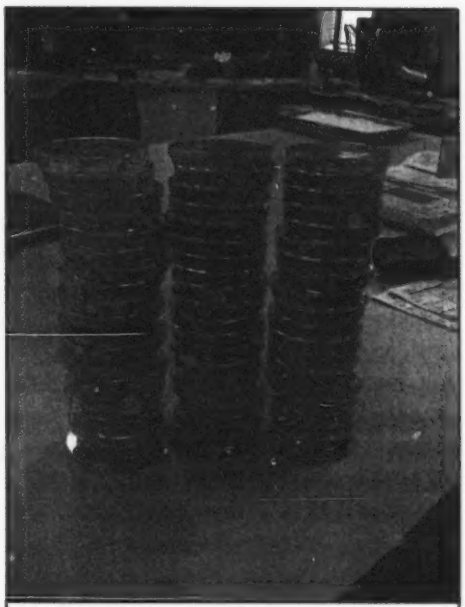

Figure 3: Seed plated for disease testing at Discovery Seed Labs.
Source: Saskatchewan Agriculture

Seed-borne pathogens may be present as a contaminant of the seed surface by mycelium or spores (e.g. common bunt of wheat) or by larger specialized fungal resting structures (e.g. sclerotia or ergot bodies). Diseases can also infect the seed coat superficially (e.g. ascochyta blights) or cause deep colonization of the seed or embryo (e.g. true loose smut). Contact a seed testing lab to find out what diseases they will test for. A list of seed testing laboratories can be found online at www.agriculture.gov.sk.ca and search "seed testing". Seed-borne disease level thresholds can be used to interpret seed testing results (see Table 1). Farmers can discuss their results with a seed analyst, agronomist, or local Ministry of Agriculture Regional Crop Specialist. For more information visit: www.agriculture.gov.sk.ca and search "seed-borne diseases" or contact the Agriculture Knowledge Centre at: 1-866-457-2377.

Seed testing labs do not test for ergot, but it may be noticed when handling grain, and will be graded for at the elevator. Ergot is a fungal disease that affects most cereals and grasses in Canada. It is a particularly damaging disease of rye, and has also been observed sporadically over the years on wheat, durum, and triticale in Saskatchewan, with significant levels reported in 1999, 2005, and 2008. Ergot seems to have remained a problem in some fields in the province in the last few years, and has again reported as an issue in 2011. After an ergot outbreak, crop residue and soil become contaminated with a higher load of ergot bodies, placing nearby grasses and cereal crops at greater risk of infection in the following seasons.

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What We Can Learn About Plant Diseases after Harvest
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This risk increases further when cool moist weather conditions promote ergot spore production and/or when cereals experience an extended period of flowering or an induction of floret sterility due to any of a variety of agronomic or environmental factors.

Once ergot is present, little can be done to control the disease in the field, so prevention is important. Planting seed contaminated with ergot bodies can potentially spread disease to previously clean fields and there are no seed treatments registered; therefore, only clean, healthy seed should be used.

Ergot bodies can be removed through seed cleaning to improve seed grade and suitability for planting. During the field season, nearby grasses may be mowed to remove additional hosts. Prior to harvest, fields should be scouted to determine where ergot has developed, such as headlands, and those areas should be combined separately if possible.

The viability of ergot bodies decreases after one to two years; however, because ergot bodies contain toxic alkaloids, they should never be consumed by humans or fed to animals. The threshold for No. 1 wheat or barley is one ergot body per kilogram of seed. Levels toxic to livestock are 0.1 per cent ergot material, 10 ergot bodies per litre or one ergot body per 1,000 kernels. For more information visit: www.agriculture.gov.sk.ca and search "ergot of cereals and grasses" or contact the Agriculture Knowledge Centre at: 1-866-457-2377.

Crop	Disease (Pathogen)	Threshold on Seed	Action if Over Threshold
Wheat and Barley	*Fusarium graminearum*	2-3%[1]	Use seed treatment[2]
		5%[1]	Do not use as seed
	Other *Fusarium* species	5%	Use seed treatment[2]
All Pulses	Seed rot and damping off (*Pythium* and/or *Phytophthora* spp.)	N/A (soil-borne)	Use seed treatment[2]: if history of this disease, under cool-moist soil conditions, if planting kabuli chickpeas, low-tannin lentils, damaged or cracked peas.
	Seed rot and seedling blight (*Botrytis* + *Sclerotinia* + *Fusarium*)	10%	Use seed treatment[2]
Chickpea	Ascochyta blight (*Ascochyta rabiei*)	0.3%	Do not use as seed
Lentil	Ascochyta blight (*Ascochyta lentis*)	5%	Use seed treatment[2]
		10%	Do not use as seed
	Stemphylium blight	N/A[3]	-
Field Pea	Ascochyta complex	10%	Use seed treatment[2]

[1]Do not bring seed into regions where *F. graminearum* is not common unless test shows zero disease.
[2]Consult 2011 Guide to Crop Protection for registered seed treatments.
[3]Significance of seed-to-seeding disease transmission is unknown. Proceed with caution. ✿

Insect Pests in Saskatchewan Crops in 2011

By Scott Hartley, PAg, Provincial Specialist, Insect and Vertebrate Pests

Several insect pests caused concern for producers in Saskatchewan during the 2011 growing season depending on location in the province and crop. For some insects this was likely a one-year situation whereas for others, an increasing population in 2011 may indicate similar problems for 2012. Ultimately the main factor determining insect infestations in the growing season will be climatic conditions in the spring.

The cool, wet conditions in the spring were not favourable to many above-ground insects. However, subsurface insects such as wireworms and cutworms were not as affected by below normal ambient temperatures.

If **wireworms** infestations were noted during the growing season they are likely to be a problem in the same area next year. Wireworm control is through the use of seed treatments and therefore management decisions and preparation will need to be made prior to seeding in 2012. There are several wireworm species present in Saskatchewan soils, and although they have host preferences they are not highly mobile, feeding on germinating plants present. Crop rotation is generally not an effective management tool.

Cutworms were a widespread problem with some species causing damage through to the end of June. Several species, both subsurface and foliar feeding, were reported. As in the previous growing season, many of the reports of cutworms were in canola. Infestations are difficult to predict and scouting the crop next season will be key in determining if control is required.

The wet spring favoured an unusual crop pest – **slugs**. More commonly pests in irrigated fields and gardens, slugs were reported in field crops on the prairies in recent years. Usually the problems were noted in low-lying wet areas or field margins but in 2011 reports included problems across fields. Slugs are molluscs, not insects. Insecticides are not developed nor registered for slug control. There are molluscicides registered for slug control but they are expensive and generally not economically viable for large fields. Dry conditions will provide the best control for slugs.

Although expanding its range, the economically damaging populations of the **pea leaf weevil** are in southwest Saskatchewan. This insect is a pest of pea and faba bean so crop rotation to a non-host crop is a viable management option. However, if the pea leaf weevil was noted in 2011 and pea is planned for 2012 a seed treatment registered for pea leaf weevil should be used. Research at Agriculture and Agri-Food Canada (AAFC) in Lethbridge showed that nitrogen application in the spring can also reduce the effects of pea leaf weevil feeding. Saskatchewan Agriculture conducted a survey for pea leaf weevil in June. Results will be mapped and posted on the Ministry of Agriculture website.

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Insect Pests in Saskatchewan Crops in 2011
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Cabbage seedpod weevil is another insect pest with the most severe infestations concentrated in the southwest. The range of this pest continues to expand to the east and also, but to a lesser degree, north. The main crop host for this pest is canola and to date the main canola producing region of the province remain free of the cabbage seedpod weevil. In 2011, however, there were potential economic infestations identified near Moose Jaw. AAFC, Saskatoon coordinates and conducts an annual survey for this weevil with assistance from Saskatchewan Agriculture. Results are posted on the Saskatchewan Ministry of Agriculture website.

The level of **diamondback moth** infestations depend on winds favourable to bring the adults north from the southern United States and Mexico during the growing season. On the Prairies monitoring programs attempt to identify potential problems using Environment Canada data related to wind currents capable of bringing in the moths as well as utilizing pheromone traps set up in early spring. Spraying for control of the diamondback moth larvae was reported in various locations throughout the province in June, continuing into late July.

In July **aphids** were reported at economic levels in a number of crops. Canaryseed and pea are crops most commonly affected by aphids but in 2011 lentil, canola and cereal crops required chemical control. Although there is some over-wintering aphid populations this insect is another pest whose population levels tend to be dependent on influx from the south and favourable (humid) climatic conditions during the growing season.

Moist climatic conditions tend to favour **wheat midge** populations and an increased risk was identified from the forecast leading into 2011. The cool conditions resulted in a slow development of degree days and associated wheat midge development. As a result, the emergence of the wheat midge adult flies was later than most years. Wet conditions also affected seeding in many areas. Some crops escaped injury to the midge when susceptibility did not coincide with midge emergence. Insecticide application was required for populations in several areas including the north central and northwest. The introduction of midge tolerant wheat varieties will also reduce the effect of midge damage. A survey for wheat midge cocoons is currently being conducted in Saskatchewan with a forecast map to be produced for 2012.

Bertha armyworm populations were on the increase in 2011 with insecticide application required primarily in northwest and east central regions. This may be an indication that this pest may be of increased risk in some areas in 2012. Bertha armyworm will be monitored by Saskatchewan Agriculture during the growing season with pheromone traps providing an estimate of risk prior to damaging larval stages of the insect.

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Insect Pests in Saskatchewan Crops in 2011
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Grasshopper infestations were not expected to be a high risk for most of Saskatchewan in 2011. Except for moderate populations reported in the Meadow Lake area in July, there were no economic infestations of grasshoppers reported. Saskatchewan Crop Insurance personnel conducted the grasshopper survey this fall. Data will be compiled into a risk map for 2012.

Other insects of note were the **imported cabbageworm**. This is the larval stage of the cabbage butterfly (*Pieris rapae*). This insect is generally not considered of economic importance but the high populations across the province in 2011 caused concern for canola producers especially if foliage was limited or feeding was on the pods. ✿

Heritage Wheat in Organic Production

By Chantal Jacobs, PAg, Provincial Specialist, Organic Crops

In Saskatchewan, heritage wheat varieties are typically grown for specialty markets and can include hulled wheats such as spelt (*Triticum aestivum* var. *spelta*), einkorn (*T. monococcum*) and emmer (*T. dicoccum*) or free-threshing wheats such as Red Fife (*T. aestivum*) and Khorasan (KAMUT®) wheat (*T. turgidum, ssp. turanicum*). The majority of these specialty wheat varieties are grown under certified organic production for specific markets.

Organic producers' interest in heritage wheat varieties has developed based on the belief that heritage wheats provide certain performance advantages under organic conditions compared to wheat varieties selected using conventional breeding programs. Heritage varieties are generally taller, later maturing and have a larger kernel size. They also tend to maintain higher yields in low soil fertility and heavier weed pressure conditions compared to modern wheat varieties.

Spelt is the most commonly grown hulled wheat on the prairies with a few thousand acres in production. There are currently four registered spelt varieties available to growers. Spelt tends to be later maturing than spring wheat and often buyers require it to be dehulled, which requires specialized equipment. Researchers at the University of Saskatchewan continue to work on developing spelt, einkorn and emmer varieties with agronomy and market specifications requested by growers and processors. Currently, einkorn and emmer are grown on minimal acreage in the province.

Free-threshing heritage wheat varieties such as Red Fife and KAMUT® are also later maturing varieties grown for specific markets. Red Fife was one of the first wheat varieties grown in western Canada in the late 1800s and was known for its good milling and baking qualities. It is no longer a registered variety and direct sales are made between producers and end-use markets such as artisan bakeries.

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Heritage Wheat in Organic Production
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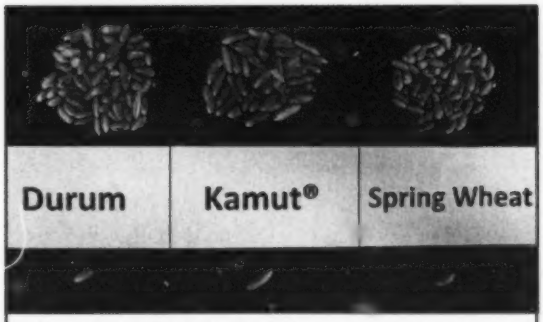

Figure 4: KAMUT® wheat, durum and spring wheat comparison.
Source: Prairie Heritage Seeds Organics Inc.

KAMUT® is a trademarked wheat variety grown on an estimated 50,000 acres in southern Saskatchewan. It is only grown on contract with two companies in the province (Prairie Heritage Seeds Organics and Artesian Acres) who provide both access to seed in spring and delivery options in the fall. KAMUT® wheat grows well in any areas that can grow high quality durum successfully, and care must be taken to avoid excess damage to the large kernels during threshing and transportation (Figure 4).

In recent years, researchers in western Canada developed a wheat breeding "proof of concept" program to compare new wheat varieties selected under organic and conventional management. Results showed that the best populations selected under organic management performed better than the top lines developed under conventional management, in organic systems. Based on these results, researchers at the University of Manitoba developed the participatory wheat breeding program. This program works with organic growers to seed small areas with new wheat populations and then actively rogue out poor performing plants within each plot. Growers will save their seed and continue this process over several years, with the goal of developing genetically diverse wheat varieties that are specifically adapted to their growing region.

Consumer interest in heritage wheat products continues to develop for a number of reasons. They are often described to have a sweet or nutty flavour, and some are noted for having enhanced mineral, carbohydrate or protein characteristics. Consumers with mild wheat allergies can often tolerate products made with these heritage varieties, as the gluten protein tends to be more digestible. However, heritage wheat products still contain gluten and are unsuitable for people affected by celiac disease.

For more information on heritage wheat varieties and organic wheat breeding programs in western Canada visit the following links:

Khorasan (KAMUT® Brand) Wheat:
www.agriculture.gov.sk.ca/Default.aspx?DN=fb6302eb-f609-471e-a398-2627bf869f7f

Organic Cereal Breeding in Western Canada:
www.organicagcentre.ca/NewspaperArticles/na_cereal_breeding_bf.asp htt

Breeding Spring Wheat for Organic Agriculture:
www.organicagcentre.ca/Docs/TechnicalBulletins09/W2009-52%20Wheat%20Breeding%20BulletinFINAL.pdf ✿

An Overview of Weather and Pest Problems affecting Saskatchewan Fruit Crops in 2011

By Forrest Scharf, AAg, Provincial Specialist, Fruit Crops

The 2011 crop year was filled with a diverse range of pest problems. In most locations, above-average snow accumulation occurred over winter. The snowpack provided insulation that helped some species (like strawberries) survive low winter temperatures, but it also created flooding that caused drowning (especially in the Qu'Appelle Valley and other low-lying areas in the southeast). Some snow drifts were high enough to allow deer and rabbits to pass over orchard fencing to forage on plants. Due to limited ability to source nutrients from below the snow, the animals caused very extensive damage to stem and branch tissues above the snowline. In apples where scion wood is budded onto dwarfing rootstock, most of the foraging and subsequent death of top-growth occurred above the graft union. This means that in most cases growers will not have to replant rootstock, or re bud scion wood onto the rootstock. The majority of the damaged trees sent out vigorous new top-growth over the summer, but it takes two years of re-growth before significant yields from new branches can be obtained.

Figure 5: Saskatchewan Crop Insurance Corporation staff inspecting rabbit damaged apple trees in 2011.
Source: Saskatchewan Agriculture

Dwarf sour cherries displayed unique responses to the snow and flooding. Cherry branches below the snowline flowered earlier and slightly more profusely than exposed branches. In regard to flooding, cherries thought to have drowned in low-lying areas were observed to re-establish themselves later. In some locations the plants were in standing water for over a month, but when the water eventually drained away new growth appeared on tissues that were not killed. Needless to say, production from the flood-affected plants will be negatively impacted for several years, and some pruning of dead wood may be advisable.

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An Overview of Weather and Pest Problems affecting Saskatchewan Fruit Crops in 2011

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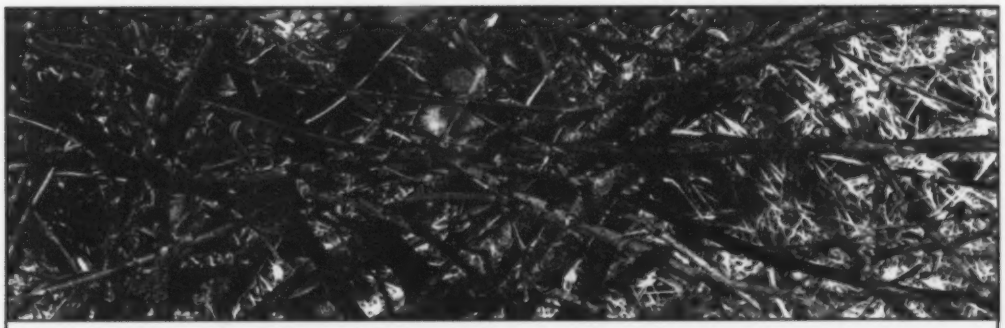

Figure 6: Dwarf sour cherry with new growth emerging from branches thought to have been dead from drowning.
Source: Saskatchewan Agriculture

Most fruit insect pest populations emerged from winter with average to above average survival rates. A few of the species whose populations increased include: currant spanworm (black currant); black cherry aphid (dwarf sour cherry); raspberry fruitworm and raspberry sawfly (raspberry); aphids (especially on apples, but also noted on haskap); chokecherry fruit gall midge, fall webworm and ugly nest caterpillar (chokecherry); apple curculio and round-headed apple tree borer (saskatoons); mites (strawberry, raspberry); and various leafrollers (strawberries, raspberries, saskatoons). Some populations of beneficial insects were also on the increase, including: hover (syrphid) flies and dragon flies (pictured below). A couple of the normally problematic insect pest populations that appeared to be at roughly average levels were cherry fruit flies, and apple maggots.

Figure 7: (left to right) Apple curculio on saskatoons, black cherry aphids on sour cherry, and chokecherry fruit gall midge infection.
Source: Saskatchewan Agriculture

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An Overview of Weather and Pest Problems affecting Saskatchewan Fruit Crops in 2011

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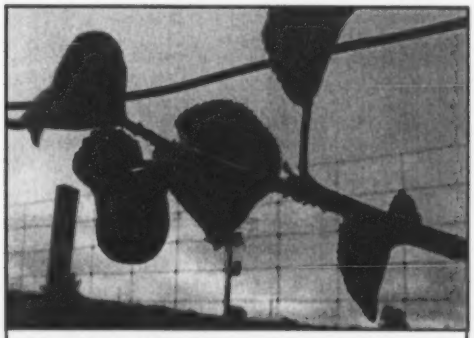

Figure 8: Aphids on lower surface of apple leaves.
Source: Saskatchewan Agriculture

Figure 9: Mites on lower surface of raspberry leaf.
Source: Saskatchewan Agriculture

Figure 10: Hover (*Syrphid*) fly on raspberry leaf.
Source: Saskatchewan Agriculture

Figure 11: Dragon fly on raspberry, pervasive in most orchards.
Source: Saskatchewan Agriculture

Diseases could be found at low levels within most orchards and most growers were able to spray to control them (unlike in 2010 when most growers could not enter their orchards due to overly wet conditions). North-western areas of the grain-belt were relatively dry during the bloom period and therefore some diseases did not encounter the right conditions to thrive there. The rest of the grain-belt was relatively wet while the plants were blooming, and therefore disease pressure from some species was strong. The diseases that caused significant loss included: saskatoon leaf and berry spot (*Entomosporium*) on saskatoon berries; american brown rot (also known as brown rot blossom blight) in dwarf sour cherries; fire blight on apples and saskatoons; silver leaf in apples; botrytis in raspberries; bacterial canker in dwarf sour cherry; shot hole on chokecherry, and powdery mildew on many species (including haskap and strawberries). Iron chlorosis was also evident on saskatoons, cherries, and strawberries (especially in wet high pH soils). ✿

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An Overview of Weather and Pest Problems affecting Saskatchewan Fruit Crops in 2011

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Figure 12: Saskatoon diseases/disorders (left to right) juniper rust, iron chlorosis, and *Entomosporium* leaf and berry spot.
Source: Saskatchewan Agriculture

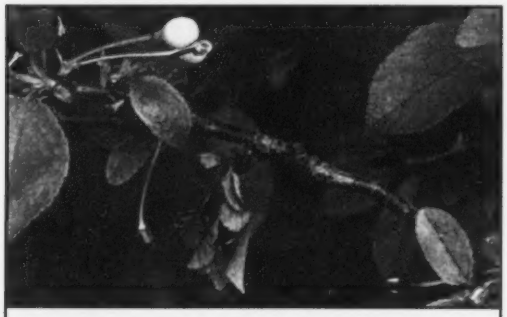

Figure 13: Brown rot blossom blight on dwarf sour cherry.
Source: Saskatchewan Agriculture

Figure 14: Silver leaf on apple.
Source: Saskatchewan Agriculture

Figure 15: Shot hole on dwarf sour cherry.
Source: Saskatchewan Agriculture

Figure 16: Powdery mildew on haskap.
Source: Saskatchewan Agriculture

Fall Soil Testing

By Ken Panchuk, PAg, Provincial Specialist, Soils

Soil testing determines the level of plant available nutrients present in the soil or, in the case of root simulator probe technology, the nutrient supply rate. It is needed to determine the balance and amount of nutrients to be added as fertilizer. Given the wet 2010 season and wet conditions again in 2011, nitrogen levels will be variable and difficult to predict for the next cropping year, making soil testing much more important and valuable. The only way to find out is to soil test. One of the best times to soil test is in the fall when there is more time to do the job right. Soil sampling can start as soon as the soils cool to below 10 degrees C that usually occurs about the first week of October.

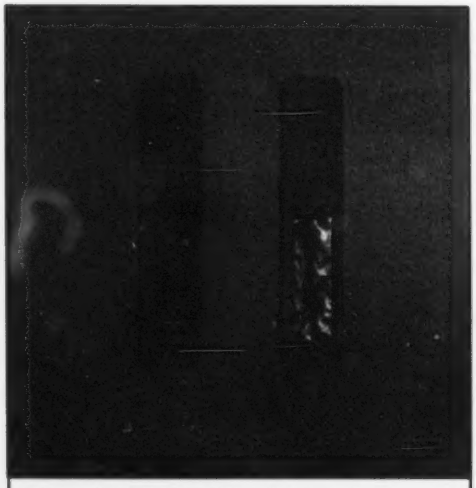

Figure 17: The Root Simulator Technology uses two resin strips, an anion and a cation strip, to determine the supply rate of soil nutrients.
Source: Saskatchewan Agriculture

Fall soil sampling provides enough time to: sample the fields properly to get truly representative soil samples, order the required fertilizer nutrients, and where needed, fall-band nitrogen before freeze up.

For accurate soil test results ensure that you:

- Contact the soil test lab for proper sampling procedures and shipping instructions;
- Provide the lab with cropping history, seeding intentions and subsoil moisture recharge at the time of sampling;
- Measure subsoil moisture in each field again, near freeze up to assist in crop planning by setting realistic target yields, and;
- Measure subsoil moisture again in spring to make final adjustments to crop inputs.

It is a good idea to call the soil test lab to understand their sampling procedure and recommendation philosophy to determine if they are consistent with your nutrient management objectives. Soil sampling is also an important step in adopting the industry developed 4-R nutrient stewardship plan: The **R**ight source, at the **R**ight rate, applied at the **R**ight time and **R**ight placement. ☼

Crop Rotation Considerations

By Sherrilyn Phelps, PAg, Regional Crops Specialist, North Battleford and Shannon Urbaniak, PAg, Regional Crops Specialist, Prince Albert

Crop rotations are designed to maintain crop and soil health to ensure long term sustainability. Crop sequences deal with the effects of previous crops on current crop choice. A successful crop rotation encompasses many farm management components including economics, fertility, soil biology and insect, disease, weed and pesticide considerations. The following eight questions should be asked when planning crop rotations:

1. What crops should I include in my rotation?
Diversity is key. Growing cereals, oilseeds and pulses in a long term rotation has been shown to provide the best benefit to soils and to crop yields. Wheat grown in a rotation with oilseeds and pulses was 16 per cent higher yielding than continuous wheat grown on the same land at Scott from 1993 to 1999. Wheat yields following flax, pea, and canola were 16 per cent, 11 per cent, and eight per cent higher, respectively, than after wheat (Manitoba Crop Insurance data, Bourgeois and Entz, 1996).

2. What are the nutrient levels in each field?
Soil testing is important, particularly after dealing with excess moisture conditions. Nitrogen level variability will also be an issue in fields with flooding of depression areas. Knowing the soil nutrient levels through soil testing allows producers to balance nutrient levels in the field with consideration of crop nutrient requirements. Oilseeds, such as canola, have the highest nutrient requirements of the major Saskatchewan field crops, followed by cereals and then pulses.

Pulses or legumes can fix up to 80 per cent of the nitrogen they need from the air (Table 1). This means that less nitrogen is removed from the soil. Legume residue has a significant amount of nitrogen in it, which then will become available to future crops as it decomposes. Thus legumes increase the nitrogen supplying power of the soil and reduce the need for nitrogen fertilizer. A nitrogen credit is included in the soil test recommendation made by Saskatchewan soil-testing labs if you report your previous crop as a legume.

Table 1. Nitrogen fixed by various legumes.

Crop Type	Nitrogen fixed by the crop:
Fababean	200-335 kg/ha
Alfalfa	130-335 kg/ha
Pea	55-225 kg/ha
Lentil	10-170 kg/ha
Chickpea	20-135 kg/ha
Dry Bean	5-80 kg/ha

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3. How much water is available and where are the nutrients?
Rooting patterns, crop maturity and growth stage can influence nutrient uptake and water use. The deeper the roots the more accessible they are to water and nutrients further in the soil profile. Varying crops in a sequence allows you to take advantage of the different root patterns and growth habits to access water and nutrients at different levels and at different times of the year.

Canola and mustard love water and nutrients, and are deeply rooted. Thus, canola and mustard are a good fit for wetter areas of the province as they can penetrate deep into the soil to reduce subsoil moisture and access nutrients that may have leached deeper into the soil profile. The deeper tap roots also help with improving soil aeration and drainage. Cereal crops are also deep rooted but tend to need the moisture earlier in the season and can withstand drier conditions better than canola. Pea and lentil are shallow rooted and have shorter maturities. This means that there will likely be more moisture left in pea or lentil stubble than cereal or canola stubble.

4. Are there soil biology considerations that may influence crop choice?
Soil biology is also important. For example, mycorrhizal fungi in the soil form mutually beneficial relationships with most plants. The fungi penetrate the roots and extend hyphae (threads) into the soil where they can access more nutrients and water for the plant. Thus, they act like highly effective transport systems. Pulses form strong associations with these mycorrhizal fungi, while cereals are less dependent, and canola and other Brassicas do not generally form these associations. It is suggested that highly mycorrhizal crops may fit best after a crop that is at least somewhat mycorrhizal, such as planting peas on cereal stubble. This may somewhat explain why crops like peas and flax tend to do better on cereal stubble than on canola stubble.

5. What disease issues did I have in the past and when was the last time I grew this crop?
Crop rotations can be a significant management tool when it comes to residue and soil borne plant disease organisms.

Leaving a rest period between certain crops can successfully reduce plant pathogen populations to a level where other disease control methods will work more effectively. Table 2 shows the risk associated with shortening the recommended crop rotation based on the disease of concern.

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Table 2. Disease risk associated with shortening the recommended crop rotation intervals.

Disease	Crop Affected	Recommended Rotation	Disease Risk under Shortened Rotation
Common root rot	Cereals	2-3years	Low
Take-all	Cereals	1 year	Low
Leaf Spots (septoria leaf blotch, tan spot, net blotch)	Cereals	2-3 years	Low-moderate
Fusarium head blight	Cereals	2-3 years	Moderate
Ascochyta blight (host-specific pathogen)	Lentils, peas, chickpeas	3-5 years	High
Sclerotinia stem rot	Most broadleaf crops, not cereals or grasses	>5 years	Moderate-high
Blackleg	Canola	4 years	High

Source: Bailey, AAFC Saskatoon

The general recommendation for cereals is to plant no more than two years in a row and incorporate different cereal species and varieties into the rotation. With canola, blackleg spore numbers and viability of sclerotia (sclerotinia stem rot's resting bodies) are significantly reduced after four years. Therefore, canola should only be planted once in a four year rotation. Sclerotinia stem rot can also affect crops such as lentils and peas so it is good practice to avoid growing pulses on canola stubble and vice versa. In fact, the recommendation is to grow peas or lentil no more than once in every four years in rotation with canola.

Choose varieties that have disease resistance and consider fungicide use during the growing season. Fungicide products should be rotated (use different active ingredients in succession) to minimize development of resistant pathogen populations.

6. Are there weed issues to consider and is there potential for a high number of volunteers from the previous crop, or is the field fairly clean?
When selecting a crop it is important to consider the weed control needs or limitations. Crops, such as lentils that are uncompetitive and have limited weed control options, should be seeded into the cleanest fields. Matching weedier fields with crops that are more competitive and have better herbicide options is important.

It is not just the presence of weeds but potential volunteers from the previous crop that should be considered. Canola, for example, can be problematic as a volunteer so having options in next year's crops is key. Rotating cereals with broadleaf crops usually allows good control of volunteers.

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7. Are there residual herbicide considerations?
It is important to know the residual properties of the herbicides you are applying in order to avoid any unwanted cropping restrictions in your crop rotation. The length of time it takes herbicides to break down can vary and is dependant upon a number of factors including soil organic matter, soil pH, rainfall and temperature. In saturated soil conditions, herbicides that rely on aerobic microbes requiring oxygen may take longer to deactivate. On the other hand, herbicides that rely on a process called chemical hydrolysis will break down equally well in aerobic or anaerobic conditions. Some basic guidelines to follow include:

- Herbicides with re-cropping restrictions under dry conditions will most likely have limitations under saturated conditions
- Fields that were seeded but that were saturated for a significant part of the season are unlikely to have seen much herbicide breakdown

It is important for producers to check with herbicide manufacturers for recommended re-cropping options in fields that were recently saturated. Further information on soil residual herbicides and re-cropping restrictions can be found in the Weed Control Section of the current *Guide to Crop Protection.*

8. Does my crop selection allow me to rotate herbicides?
Herbicide resistance has been increasing in frequency particularly with Group 1 and Group 2 herbicides. Weeds that have developed resistance to particular herbicide groups in Saskatchewan include: cleavers, chickweed, green foxtail, kochia, wild mustard, Persian darnel, Russian thistle, stinkweed, wild buckwheat and wild oat. It is estimated that over 90 per cent of the kochia populations are now resistant to Group 2 herbicides. Rotating or mixing herbicides from different groups on each field (on your farm) is critical to preventing the development of resistance. This is the case with all pesticides, including fungicides, insecticides and herbicides. More information on herbicide groups can be found in the current *Guide to Crop Protection*, at the beginning of the Weed Control section.

Planning crop rotations is complex. For the latest information on rotations we invite you to attend the Agronomy Research Update on Dec 8 and 9th at the University of Saskatchewan in Saskatoon. The first day of the event focuses strictly on crop rotations. For more information on the event see the event information below.

For more information visit www.agriculture.gov.sk.ca and search 'crop rotation' or contact your Regional Crop Specialist or the Agriculture Knowledge Centre at 1-866-457-2377.

Agronomy Research Update

Dec. 8 & 9, 2011

University of Saskatchewan, Saskatoon, SK

Thursday, December 8

Western Canadian crop rotation: What's happening and what are the implications?

8:30 am to 5:00 pm

Keynote speaker – Dr. Martin Entz
Agronomic practices – Dr. Yantai Gan
Pathology – Dr. Randy Kutcher
Soil microbiology – Dr. Diane Knight
Economics – Mr. Larry Weber
Weed management – Mr. Eric Johnson
Provincial stats – Mr. Venkata Vakulabharanam
Crop nutrition – Dr. Rigas Karamanos
Break out –key questions addressed

Friday, December 9

Research Update

8:30 am to 2:30 pm

Thirty minute research updates from Agriculture and Agri-Food Canada, the University of Saskatchewan, and Agri-ARM. The key information top agronomists need to know.

Brought to you by Prairie Certified Crop Advisor Board, Saskatchewan Ministry of Agriculture and University of Saskatchewan.

For more information watch for the invite coming soon or contact Trish Meyers, (306) 241-1216 or Shannon Urbaniak (306) 953-2362.

Book your Calendar:

For the Soils and Crops workshop focusing on soil nutrient management, March 13-14, 2012 at the Prairieland Park in Saskatoon, SK.
Details at www.usask.ca/soilsncrops/index.html.

The Saskatchewan Green Trades Conference

By Glen Sweetman, PAg, Provincial Specialist, Nursery and Greenhouse Crops

The Saskatchewan Green Trades Conference will be held from Nov. 11-12 in Saskatoon.

Conference partners include the Saskatchewan Greenhouse Growers' Association, Saskatchewan Vegetable Growers' Association, Saskatchewan Seed Potato Growers' Association, Saskatchewan Parks and Recreation Association, and the Saskatchewan Nursery and Landscape Association. These organizations serve the province's greenhouse bedding plant producers, greenhouse and field vegetable producers, potato producers, market gardeners and garden, nursery and landscape centres.

There will be five concurrent sessions featuring top industry speakers from across North America. Conference topics include: information on production techniques and tools; pest management; new varieties; research and marketing, with more topics added as the conference approaches. The talks are beneficial to all levels of producers, including potential producers and seasoned professionals. The conference is also a valuable training opportunity for staff working in the horticulture industry.

Pre-conference workshops are scheduled for Nov. 10 and include: Integrated Pest Management; A New Era - Speaking and Selling to Today's Consumer; and Improved Grounds Maintenance. These workshops are up to four hours long, which allows experts the time to cover topics in greater depth than at the general sessions.

The Saskatchewan Green Trades Conference continues to grow in size, membership and popularity. Informative speakers, a fantastic trade show and ample opportunity to network make this a popular event.

For more information

- Visit the conference website at www.sgtc.ca.

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